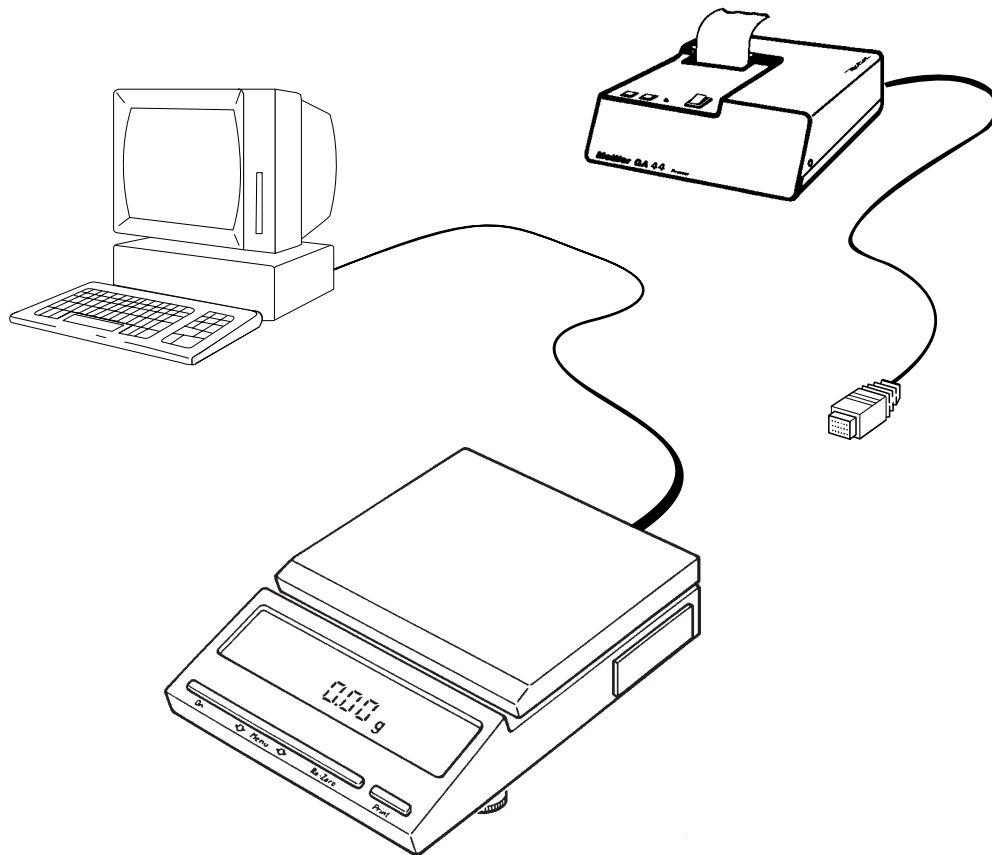


Operating instructions

Bidirectional Data Interface

METTLER TOLEDO Balances BB

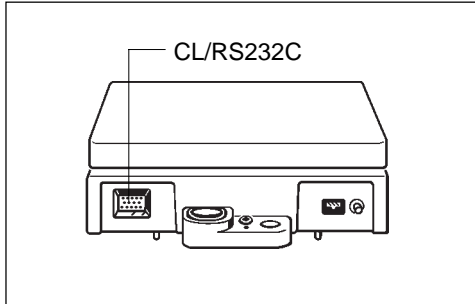


METTLER TOLEDO

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1. Overview



1.1 What are the interface capabilities?

The METTLER TOLEDO BB balances are fitted with a bidirectional data interface as standard. They can transfer weighing results to a peripheral unit (computer, terminal, printer, etc.) via 20 mA current loop or RS232C. At the same time, however, they can also receive and execute commands (full duplex operation). It is thus possible to integrate BB balances in a controlled weighing system.

In the bidirectional operation the following functions are available:

- Automatic transfer of measured values
- Taring and tare preset
- Weight unit change
- Text in balance display
- Calibration
- Transfer of balance identification

2. Preparation

2.1 Matching the interface to the unit to be attached (configuration)

The interface parameters shown opposite can be selected:

Procedure:

- Switch off balance → standby No display.
- Press and hold down control bar until ↓ -----
- Release bar. -CONF- appears.
- rESEt appears.

Setting the **default parameters** (black).

- Press and hold down bar until 4ES
- ↓ -End-
- 0 1888888 g appears.

For **other** settings:

- Following rESEt
- press bar briefly. I-FACE appears (Interface)
- ↓
- Press and hold bar until the first parameter appears.
- Accept displayed parameter → Keep bar pressed, until the next appears.
- Modify parameter → Press bar briefly.

5 5tb

5 RLt

5Auto

5Cont

2.1.1 Data transmission mode (see section 4):

- stable single values
- current single values (stable or not)
- stable single value after each weight change
- all values, continuous

b 110

•

b 2400

•

b 9600

2.1.2 Transmission rate (baud rate):

- 110 baud
- 2400 baud
- 9600 baud

P -E-

P -0-

P -1-

P -5-

2.1.3 Parity

- Even
- Odd
- Mark
- Space

PSE 00

PSE H5

PSE 10

PSE 20

2.1.4 Pause between data lines and handshake:

- for rapid peripherals (computer etc.)
- utilize handshake line
- for slow peripherals (printer etc.),
- 1.0 or 2.0 sec. pause between the data lines

Ru OFF

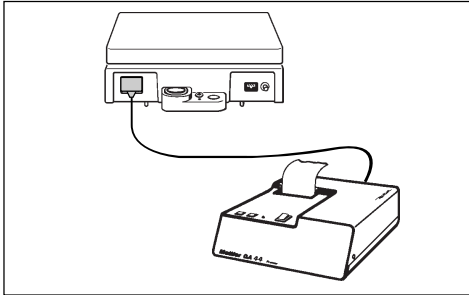
Ru on

-End-

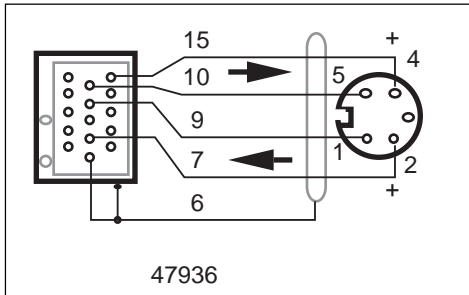
2.1.5 Auxiliary units

- For peripheral units that can not recognize the characters <...> or the result in the animal weighing mode*

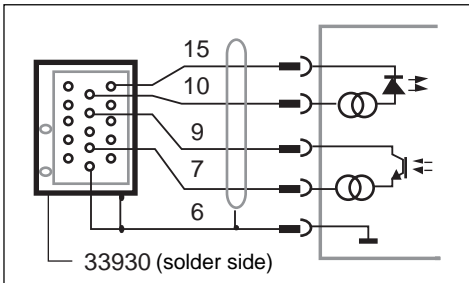
2.2 Attaching units with current loop interface



The METTLER TOLEDO **GA44** Printer can be attached directly to the BB balance (in the standard configuration). The appropriate cable is enclosed with the printer (for extra cables: Order No. 47926).



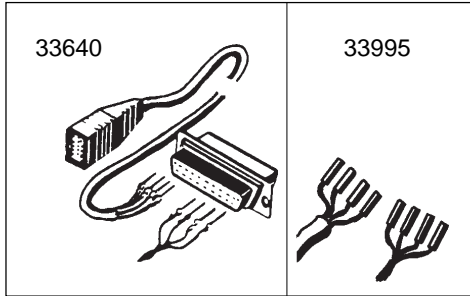
For the attachment of **other Mettler units** with CL interface (solder side) the 47936 cable must be ordered. The illustration shows the wiring.



A **non-METTLE TOLEDO unit** can be attached to the BB balance as shown in the illustration. The non-METTLE TOLEDO unit must take over the power supply of the CL interface and here it is essential that the limiting data described in section 3.4 are observed. The I/O balance connector ("MiniMETTLER") can be ordered as an accessory: 33930.

2.3 Attaching units with RS232C interface

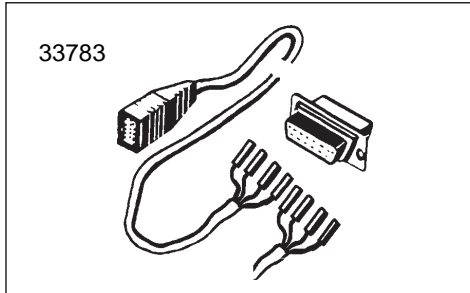
Prepared cables are available for the following units: Printer **EPSON P-40** Order No. 33688
 Computer **EPSON PX-4** 33982
HX-20 33955



For other units with an RS232C interface, **cables with freely attachable contacts** can be ordered. One end of the cable carries the permanently attached I/O balance connector, the other end the connector with the freely attachable contacts.

Cable set with 25-pin connector (male) Order No. 33640
 Cable set with 25-pin coupling (female), e.g. for IBM-PC, IBM-XT 33995
 Cable set with 9-pin coupling (female), e.g. for IBM-AT, Toshiba T1000 33783

Depending on whether the unit to be attached is a data terminal unit (DTE) (see also 3.5) or a data communications unit (DCE) the cable must be wired as follows:



		Connector, view from cable end			
		1 13 14 25		1 5 6 9	
Balance	Description of the function	DTE	DCE	DTE	DCE
2, green	commands for balance	2	3	3	2
12, brown	data from balance	3	2	2	3
13, white	signal ground	7	7	5	5
3, yellow	handshake for balance	4/20	5/6	4/7	6/8
	short-circuiting link (optional)	20/4	6/5	7/4	8/6
		5	4	8	7
		6	20	6	4
		8		1	

3. Interface

3.1 How does the interface function?

The METTLER TOLEDO BB balance has an RS232C voltage-controlled interface and a passive 20 mA current loop interface (CL). These interfaces can be used not only unidirectionally but also in bidirectional full duplex operation.

The data outputs of both interfaces operate in parallel. Both outputs can be used at the same time, but only one input, either CL or RS232C.

The command input is active as soon as the display is switched on. The data outputs remain blocked until the start routine has been completed.

Transmission principle: serial by bit, asynchronous (1 start bit), 7-bit code ASCII-ISO646 + parity bit, 1 stop bit (receive), 2 stop bits (send)

Switching off the other unit or a break in the interface cable resets the balance in the configured condition in the case of bidirectional operation, i.e. all functions that are triggered with commands via the interface (transmission mode, tare preset, text display, etc.) are reset.

The configuration of the interface parameters is described in section 2.1.

Operating modes:

- **Free Mode**
- **Handshake Mode**
Software handshake according to “Technical Information Bulletin” TIB: “The METTLER TOLEDO CL Interface”. Order No. in section 3.4 “General information regarding METTLER TOLEDO CL interface”.

These operating modes can also be used for the RS232C interface.

Matching of data supply and demand between balance and unit to be attached

Data losses can selectively be prevented as follows without the need for handshake lines:

1. With the handshake mode (software handshake)
2. With an **adjustable pause** time between the data strings of up to 2 seconds.
3. By **selective request** of the weighing result with the command $S I_{C_R L_F}$. If the balance can not provide a valid result, it sends “SI” immediately. The controlling computer is thus informed at all times that it must once again request a measured value.

The hardware handshake described in what follows also offers a possibility to control the data flow.

3.2 Hardware handshake RS232C

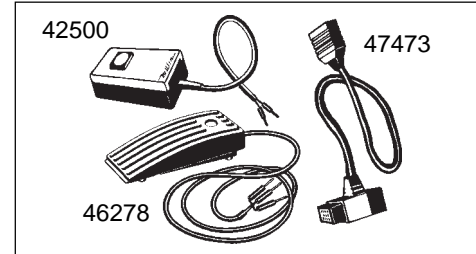
With the aid of a separate signal line the BB balance can be “braked” during the transmission of values via the RS232C interface, i.e. the balance sends data only if the attached unit sends a ready message. The attached unit must be equipped with handshake functions and be wired in accordance with section 2.3.

The signal is evaluated when “PSE HS” has been set in the configuration and when the line is actually wired up.

If a positive voltage is applied to the handshake line or if it is open, the balance sends. In the case of a negative voltage it does not send. If the level changes from positive to negative during a transmission, maximum 2 additional characters are transmitted.

If this handshake function is used, the data output functions shown opposite may not be used.

3.3 Data output by means of auxiliary switch



The data output can be initiated by a hand or foot switch. For attachment of the switch an additional adapter cable is needed. This extends the I/O interface socket of the balance to the rear and carries a 2-pin socket on a Tee joint for attachment of a hand or foot switch.

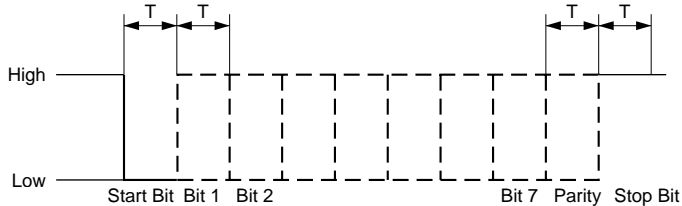
Adapter cable	Order No.	47473
Hand switch	Order No.	42500
Foot switch	Order No.	46278

If this type of transfer initiation (or the PRT key on the GA44 Printer) is used, the handshake function described opposite is precluded.

You will find details of the data output in section 4.

3.4 General information regarding CL interface

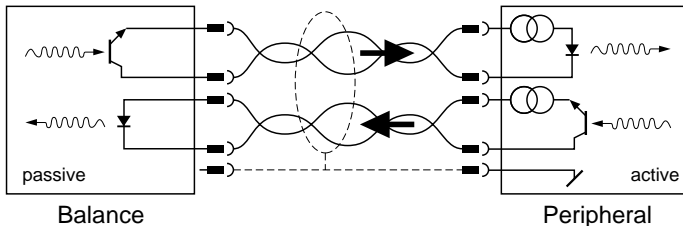
Technical data: 20 mA current loop interface, full duplex
2 separate transmission loops
serial by bit, asynchronous (1 start bit)
7-bit code (ASCII, ISO-646) + parity bit,
in idle state 20 mA current (high level)



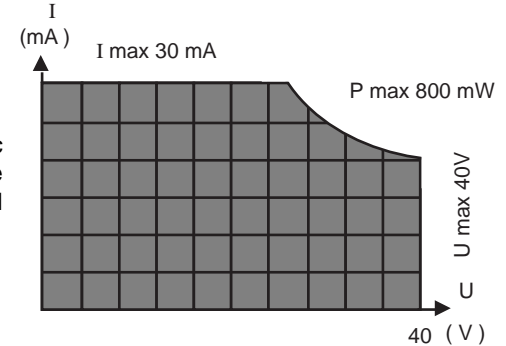
A break in the loop at time T starts the character transfer. The transfer of the single character is completed by closing the loop by minimum time T again.

The CL interface of the balance has two passive, independent transmission loops.

The passive current loops of the balance must thus be supplied by



external current sources. To avoid damage to the CL interface by these external current sources, it is essential to observe the following limiting data:



The U/I characteristic of the source must lie within the hatched area.

The interfaces of the METTLER TOLEDO units require the following specifications:

- voltage excursion of source 15 V (+10/-0%)
- current (high) between 18 mA and 24 mA
- rate of change 2...20 mA/μs
- cable: shielded, twisted pairs,
0,14 mm², 125 Ω + 130nF/km
max. length: 1000 m/300 baud, 500 m/2400 baud

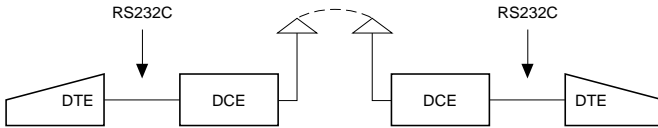
For further information see also “The METTLER TOLEDO CL Interface” order no. 720107.

3.5 General information regarding RS232C interface

Voltage-controlled interface in accordance with the standards EIA RS232C, DIN 66020. These standards conform to the CCITT recommendations V.24 and V.28.

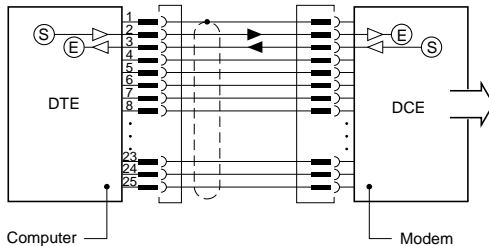
A distinction is made between two types of equipment:

- Data Terminal Equipment (DTE), e.g. teleprinter, printer, IBM-PC
- Data Communications Equipment (DCE), e.g. modem, transmitter



The RS232C interface was originally conceived to link such data terminal equipment with data communications equipment. The lines and signals have been designed for this original configuration, which is still in use today.

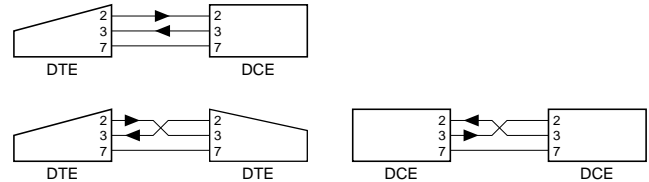
Example:



- A DTE unit sends its data via connection 2 (data direction DTE → DCE).

- A DCE unit sends its data via connection 3 (data direction DCE → DTE)

For short distances (< 15 m) where data highways are not practical, the RS232C interface is also used for any two units, i.e. the combinations DTE - DTE and DCE - DCE are entirely possible. Certain signals and lines can be omitted in such cases. A minimum configuration can be implemented with two (unidirectional operation) or three lines (bidirectional operation).



In addition to the above-mentioned interface lines the most common handshake lines are shown below:

DTE	1	Protective Ground		1	DCE
	2	Transmit Data	TxD	2	
	3	Receive Data	RxD	3	
	4	Request to Send	RTS	4	
	5	Clear to Send	CTS	5	
	6	Data Set Ready	DSR	6	
	7	Signal Ground	GND	7	
	8	Data Carrier Detect	DCD	8	
	20	Data Terminal Ready	DTR	20	

The definition of the above terms is from the angle of the DTE.

4. Data output

4.1 Initiating the data output

The balance has always a current weighing result available that can either be stable or unstable, valid or invalid.

Depending on the application, the data output can be initiated in the following ways:

- print key of balance
- external print key (auxiliary switch or “PRT” key on GA44)
- automatic operation (configuration: “S.Auto”, “S.Cont”)
- commands via the interface (send commands)
- loading or unloading the balance (send commands “SR”, “SNR”)

The **default setting** for the data transmission mode is:

S. Stb A stable single value is transmitted if the data transmission has been triggered by a key.

The transmission mode can be modified in the **configuration register** (I-Face), (see also section 2).

S. All A current single value (stable or unstable) is transmitted if the data transmission has been triggered by a key.

S. Auto A stable value is transmitted automatically after every weight change (threshold 1 g/5 g for balances with resolution $<1 \text{ g} \geq 1 \text{ g}$; if in animal weighing mode, the balance has to be unloaded completely, the threshold is 10 g/50 g).

S. Cont All values are being transmitted automatically in step with the configured interval – if it is = 0 approx. every 160 ms – or by handshake mode (unstable ones with “SD” and stable ones with “S \square ” in the identification block), see section 4.2 data format.

In bidirectional operation these transmission modes can be selected **via the interface** with send commands (see section 5), irrespective of the configured transmission mode.

Transmission mode	corresponding send command
S. Stb *	S
S. All *	SI
S. Auto	SNR
S. Cont	SIR

* initiate transmission with key

In the case of an interface break, the transmission mode is lost if it has been selected via the interface. On the other hand, the configured transmission mode remains stored until a new one is configured.

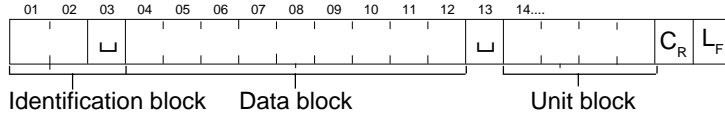
Note: The default setting for the **pause** between the data strings is 1 second (for GA44 Printer). In the case of operation with a computer this pause is too long. Therefore, in most cases, it has to be configured at (0.0).

4.2 Data format

Format of weighing result

Each valid weighing result is available at the data output in a standard format. The data string can be divided into three blocks. It is always terminated with Carriage Return (C_R) and Line Feed (L_F).

␣ = (Space)



Char.	Information	Code	Explanation
01	Initiation of data output	␣	initiated with auxiliary switch or print key, or animal weighing initiated by any method
		S	initiated with send commands or balance in "Send Continuous" mode ("S.Cont")
02	Status messages	␣	stable result
		D	unstable result (dynamic)
		*	animal weighing ¹⁾

¹⁾ Configuration "I-FACE = Au on" → ␣

Char.	Information	Code	Explanation
04...12	Weighing result	x	9 characters, result right-aligned including sign "-" directly in front of the first numeral, decimal point; leading zeros are replaced by spaces.
14...	Weighing unit		0...4 characters, terminated immediately with C _R L _F g or one of 10 other units, depending on requirements.

Example:

SD␣␣␣␣␣-24.37␣gC_RL_F

Messages on invalid weight result

In special operating modes (e.g. during overload, underload, error message etc.) the balance can not provide a valid weight result. It thus sends only a status message. This also indicates whether the data output has been initiated by means of a key or command or configuration.

Status messages on initiation by means of a **key** ("Print", "PRT", auxiliary switch) and configuration "**S.All**":

⌫I C _R L _F	invalid result ²⁾
⌫I + C _R L _F	overload
⌫I - C _R L _F	underload

Status messages on initiation of the data output by means of **commands** or through the transmission mode "**S.Cont**":

SI C _R L _F	invalid result ²⁾
SI + C _R L _F	overload
SI - C _R L _F	underload

If the balance transmits neither a result nor a status message after initiation of the data output, this means that it is waiting for a stable weight value.

²⁾ e.g. data transfer during taring process which could not be completed because of instability

General status messages

TA C_RL_F

Message in bidirectional operation of the balance: The automatic taring process after switching on the balance is complete or taring has been performed with a key.

CB⌫ < Text > C_RL_F

Response on calibration

STANDARD ⌫⌫⌫

V22.4 5.00 C_RL_F

Start message, software version

Error messages

→ section 7

Examples of BB200 printouts

Configuration "S. Cont"

```
*****
Standard  V22.45.00
S          -0.02 g
SI
TA
S          0.000 g
SD         8.2 g
SD        200.4 g
SI+
S          195.47 g
S          195.46 g
```

Configuration "S. All"

```
*****
Standard  V22.45.00
           -0.05 g
I
           0.000 g
D         17.8 g
           19.25 g
           19.24 g
           19.24 g
```

5. Commands to control the balance

5.1 General information regarding command set

BB balances with full duplex interfaces can not only send weighing results but also receive control commands at the same time. These commands are described in what follows.

Entry of cammands

Upper- and lowercase letters are not distinguished.

Each command must be terminated with the character sequence CARRIAGE RETURN (C_R) and LINE FEED (L_F).

A command without associated parameters generally resets the appropriate function.

Note: Simple program examples for bidirectional operation with the BB balance can be found in section 6.

The following symbols are used in this section:

- space
- : = definition
- < > parameter
- [] optional

Switching on the balance

In bidirectional operation of the interface the handshake is set up on startup before the switch-on zero has been determined. It is thus essential that the computer waits for the message "TA" from the balance before it sends commands. Otherwise, it must be anticipated that, e.g. SR and B commands are overwritten during this operation.

Communication failures

Commands that could not yet be executed are overwritten by newly received ones, i.e. they are lost.

A BREAK condition (see section "Interface") clears all commands and the balance again behaves as if it had been switched off and then on.

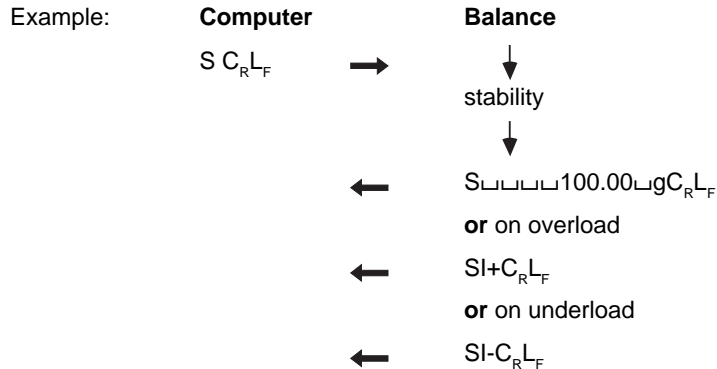
If the balance has not received a command properly or can not evaluate or execute it, it sends an appropriate error message (see section 4.3).

5.2 Command: **S** (Send value)

Format: **S C_RL_F**

Action: **The balance sends the next possible stable weighing result.**

Notes: On stability, the current result is sent immediately. With "S C_RL_F" send commands previously transmitted can be cancelled by overwriting.

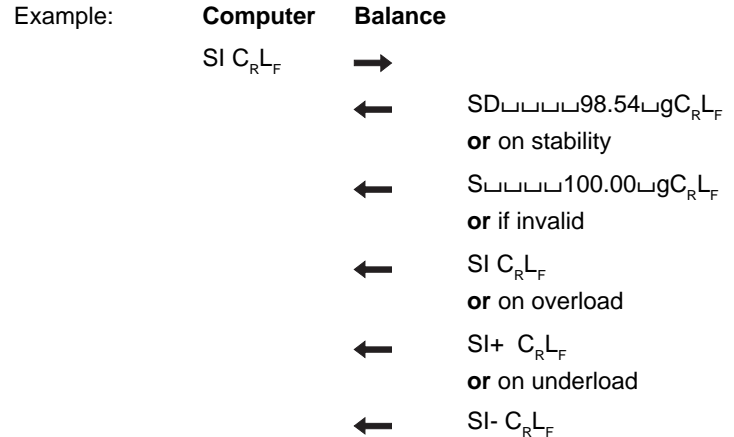


5.3 Command: **SI** (Send ImmEDIATE value)

Format: **SI C_RL_F**

Action: **The balance sends the current weighing result.**

Note: Unstable results are marked with the status message "D" (dynamic); with valid results "SI" is transmitted. (→ 4.2 Data format).



5.4 Command: **SR** (Send value and Repeat)

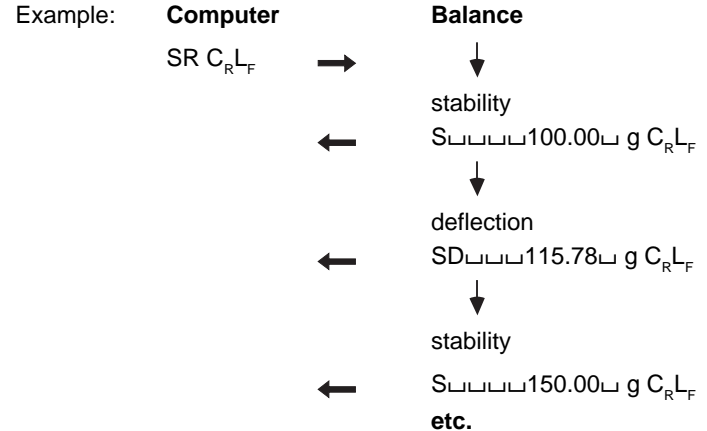
Format: **SR** [L< Threshold >]C_RL_F

Action: **The balance sends the next possible stable result and then on each load change of a certain magnitude a dynamic and the subsequent stable result.**

Parameter: The magnitude of the load change can be entered in absolute terms as a threshold value. (In the weight unit g, numerical value at least 3d*.) If this entry is not made, the magnitude is 12.5% relative to the last stable value or at least 30d*.

Note: The entry of a threshold value is advisable primarily in automatic additive weighing operation. Here, an absolute response threshold is necessary since with "SR C_RL_F" the threshold fixed as a relative value would increase with increasing total weight. This automatic transmission mode remains in force until the balance receives some other send command or the interface experiences a break.

* d = digit = smallest display increment



5.5 Command: **SNR** (Send Next value and Repeat)

Format: **SNR C_RL_F**

Action: **The balance sends the next stable result and then after every load change automatically a further stable result.**

Notes: Load change at least 1 g or 5 g (balances with resolution < 1 g or ≥ 1 g; in animal weighing mode the balance has to be unloaded completely and then loaded with at least 10 g or 50 g)
In contrast to the SR command no dynamic values are transferred.
This automatic transmission mode remains in force until the balance receives any other type of send command or the interface experiences a break.

Example:

Computer	→	Balance
SNR C _R L _F		↓ stability
	←	S□□□□□100.00□ g C _R L _F
		↓ deflection min. 1 g
		↓ stability
	←	S□□□□□150.00□ g C _R L _F
		etc.

5.6 Command: **SIR** (Send ImmEDIATE value and Repeat)

Format: **SIR C_RL_F**

Action: **The balance sends in every case the current result and then automatically all further results, at a maximum rate in step with the balance display (i.e. approx. every 0.16 seconds).**

Notes: Particularly suitable for dynamic weight determination. Owing to the large data volume of the balance (1 measured value every 0.16 seconds) the baud rate must be correspondingly high if no value is to be lost.

If a printing interval of 0.0 has not been configured, the transmit clock corresponds to the pause time (1 or 2 seconds). Intermediate values are lost.

This automatic transmission mode remains in force until the balance receives any other type of send command or the interface experiences a break.

Example:

Computer	→	Balance
SIR C _R L _F		↓
	←	SD□□□□□98.54□ g C _R L _F
	←	SD□□□□□95.76□ g C _R L _F
	←	SD□□□□□95.32□ g C _R L _F
	←	S□□□□□95.40□ g C _R L _F
		etc.

5.7 Command: **T** (Tare)

Format: **T C_RL_F**

Action: **This command can be used for taring via the interface.**

Notes: If an SI or an SIR command follows a T command while the balance is still waiting for stability, it returns "SI".
If no stable condition has been attained after approx. 10 s, the error message "EL" follows.

The time needed for taring can vary; no acknowledgement is sent when it is complete. In the case of overload/underload, taring can not be performed. The error message "EL" is sent immediately.

Example:

Computer	Balance
T C _R L _F →	Instability: ----- (wait) Stability: 0.00 g

5.8 Command: **TI** (Tare Immediately)

Format: **TI C_RL_F**

Action: **The balance is tared immediately.**

Notes: Applications for this command are:

- Taring of the balance during a consumption measurement or during a continuous dispensing operation.
- Taring from a computer that defines the stability criterion itself.
- Taring in an externally clocked system.

If taring is by chance performed below the startup zero point the balance must store this zero point again as here a high stability is necessary; taring can take up to 12 s. No acknowledgement follows when the operation is complete.

Example:

Computer	Balance
TI C _R L _F →	Unstable or stable state: 0.00g

5.9 Command: B (Base)

Format: **B** [\square < Offset >] $C_R L_F$

Action: **After receipt of this command the balance continuously subtracts the value < Offset > from all weighing results (tare preset).**

Parameter: < Offset > : = numerical value, max. 7 digits.
Enter sign only for negative values. If the offset value is omitted, the command is cancelled.

< Offset > refers to the unit that has been programmed in the configuration under Unit 1. The value must lie within the admissible weighing range, i.e. < Offset > + tare weight = 0...maximum load. < Offset > is rounded off to the balance resolution before calculation.

Notes: The tare symbol appears in the display. Taring cancels the offset command. If the offset value is outside the weighing range, the error message "EL $C_R L_F$ " will be transmitted.

Example: **Computer**

 $B \square 100 C_R L_F$



Balance
Display: 0.00 g
↓
Display: -100.00g

5.10 Command: U (Unit)

Format: **U**[\square < Unit >] $C_R L_F$

Action: **Selection of the weight unit. Entry of "U $C_R L_F$ " alone cancels the U command and switches back to the unit configured under "Unit 1".**

Parameter: < Unit >: g, kg, lb, oz, ozt, tl, GN, dwt, ct, C.M., k.,
no entry (no display of unit, display value in g)
Uppercase letters can also be entered.

Note: The entered U command remains active until it is overwritten by another command or the interface experiences a break.

5.11 Command: **D** (Display)

Format: **D**[\square [**< Text >**]] **C_RL_F**

Action: **A text is displayed. “D xC_RL_F” clears the display, “D C_RL_F” releases it for the weight display.**

The balance continues to operate normally during the text display. The execution of send commands is not affected.

Parameter: **< Text > : =** all printable characters of the ISO 646 code table, max. 6 characters. It should be noted that only the curtailed method of representation with the 7-segment display is possible (adjacent table).

Note: **< Text >** is left-aligned. If **< Text >** is longer than the balance display capacity, the **part first entered** is cut off.

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Example: **Computer** **Balance**
 Display 100.00 g
D \square TEST **C_RL_F** → tESt

Representation of text characters in balance display

The following table shows the 7 segment display for all 95 printable characters of the ISO 646 code table.

\square	'	"	≡	=	'	'	'	[]	°	†	.	-	.	'
SP	!	"	#	\$	%	&	'	()	*	•	,	-	.	/

0	1	2	3	4	5	6	7	8	9	:	;	<	≠	>	?
ø	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?

␣	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O

P	q	r	S	t	U	U		J	y	2	r	4	7	n	-
P	Q	R	S	T	U	V	W	X	Y	Z	[\]	~	_

'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o

P	q	r	S	t	u	u	"	∩	y	2	∟		∩	-
p	q	r	s	t	u	v	w	x	y	z	{		}	~

5.12 Command: **ID** (Identify)

Format: **ID** C_RL_F

Action: **The balance sends its identification (3 lines):**

< Software Version >
 TYPE: < balance type >
 INR: < Identification number >

Example: STANDARD V22.45.00 C_RL_F
 TYPE: BB3000 C_RL_F
 INR: A0 C_RL_F

5.13 Command: **CA** (Calibrate)

Format: **CA** C_RL_F

Action: **The balance is calibrated.**

The prompts “Unload balance”, “Load calibration weight” as well as the message “Calibration operation complete” are sent via the balance display and the interface.

Computer	Balance
CA C _R L _F	→ busy
	← CB _{UUUU} ----- C _R L _F
	↓
	← CB _{UUUU} 0.000 _U g C _R L _F unloaded balance
	↓
	← CB _{UUU} 200.000 _U g C _R L _F load calibration weight
	↓
	← CB _{UUUU} 0.000 _U g C _R L _F unload balance
	↓
	← CB _U 1C _R L _F successful or
	← CB _U 0C _R L _F unsuccessful or
	← ELC _R L _F inadmissible

6. Programs to get started

6.1 Communication with the balance

The below auxiliary programs enable a computer to operate as a simple terminal. They can be used to send control commands via the interface to the balance and likewise to display a weighing result and status message on the screen. It is thus possible to observe the basic mode of action of the commands.

Interface parameters (default setting of BB balance):

2400 baud, even Parity, 7 data bits and 1 stop bit

Warning: The punctuation must be adhered to exactly when typing in the programs.

Terminal program for IBM-PC

```
10 OPEN "com1:2400,E,7,1,CS,CD,DS,RS,LF" AS #1
20 IF LOC(1)>0 THEN PRINT INPUT$(LOC(1),#1);
30 K$=INKEY$ : IF K$< ">" THEN PRINT#1,K$; : PRINT K$;
50 GOTO 20
```

Terminal program for Epson HX-20

```
10 TITLE "TERM"
20 WIDTH20,4
30 OPEN"O",#1, "COM0 : (57E1F)"
40 OPEN"I",#2,"COM0 : (57E1F)"
50 IF LOF (2)>0 THEN PRINT INPUT$(LOF(2),#2);
60 K$=INKEY$:IFK$< ">" THEN PRINT#1,K$; :PRINTK$;
70 IF K$=CHR$(13)THEN K$=CHR$(10):PRINT#1,K$; :PRINTK$;
80 GOTO 50
```

Terminal program for Epson PX-4

```
10 OPEN "O",#1,"COM0:(C7E1F)"
20 OPEN "I",#2, "COM0:(C7E1F)"
30 IF LOC (2) >0 THEN PRINT INPUT$(LOC(2),#2);
40 K$=INKEY$ : IF K$< ">" THEN PRINT#1,K$; : PRINT K$;
50 IF K$=CHR$(13) THEN K$=CHR$(10) : PRINT#1,K$; : PRINT K$;
60 GOTO 30
```

6.2 Evaluation of the weighing data

For further processing of the weighing result the data string from the interface must be analyzed. The data string structure shown in section 4.2 can be examined as follows:

1. Read in data string
2. Examine first three characters of the data string (e.g. Suu, SDu, SI, SI+, SI-, TA, EL, ET, uuu, uDu, ...)
3. Process remaining data string in accordance with the first part

Program example in BASIC

Evaluation of the string

"Suuuuuuuuuu23,4g"

└───┬──────────┘ leading zeros
identification

X\$ is the received data string from the balance

```
60 IDENT$ = LEFT$( X$, 3) (search for identification)
70 IF IDENT$ = "Suu" THEN GOSUB 110
further distinctions with IF as listed under paragraph 2.
```

```
110 WEIGHT = VAL (MID$( X$, 3)) (search for weighing result)
120 LE = LEN (X$) (search for weight unit, 120...160)
130 FOR I = LE-1 TO 1 STEP -1
140 ST = INSTR(I,X$," ") : IF ST <> 0 THEN I = 1
150 NEXT
160 UNIT$ = RIGHT$(X$,LE-ST)
```

further processing of WEIGHT and UNIT\$

Program example in PASCAL

GetString1 = Input buffer

```

BEGIN
  inputstring :=GetString1;
  Weight := ''; Unit :=''; j := 1;
  Ident := Copy (inputstring, 1, 3);
  IF Ident = 'S ' THEN
  BEGIN
    WHILE (Ord (inputstring[j]) < 65) AND
      (j <=Length (inputstring)) DO
      BEGIN
        Weight := Weight + inputstring[j];
        j := j + 1;
      END;
    Unit := Copy (inputstring, j, 4);
  END ELSE

```

further distinctions with IF as listed under paragraph 2,

further processing of Weight and Unit

END.

Program example in C

```

char InputString[30];
char Unit[5];
char Ident[4];
float Weight;

sscanf(InputString,"%3s%f%s",Ident,&Weight,Unit);

if(strcmp(Ident,"S") == 0) /* stable weight */;

```


7. Malfunctions

7.1 What happens if ...?

... one of the following error messages
is transmitted at the interface?

ES	A received command is wrong (<u>S</u> yntax <u>E</u> rror); the required command structure has not been adhered to.
EL	A received command is semantically (in content) wrong (<u>L</u> ogistical <u>E</u> rror). It is syntactically correct but can not be executed for some reason or other. Example: tare command, if balance in overload or underload.
ET	The received character sequence has not been correctly received (<u>T</u> ransmission <u>E</u> rror). Probably the transmission parameters of computer and data interface of the balance do not match.
... the data output is too slow/ too fast?	The standard setting for the pause between the data strings is 1 second (for GA44 Printer). The pause can be selected in the configuration (PSE):0.0, HS, 1, 2 seconds.

In troubleshooting note also the operating instructions of the balance.

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Subject to technical changes and to the availability
of the accessories supplied with the instruments.

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